The Use and Availability of Medical Care in Health Manpower Shortage Areas
Author(s): Marc L. Berk, Amy B. Bernstein and Amy K. Taylor
Source: *Inquiry*, Vol. 20, No. 4 (Winter 1983), pp. 369-380
Published by: Sage Publications, Inc.
Stable URL: http://www.jstor.org/stable/29771599
Accessed: 04-02-2016 22:04 UTC

REFERENCES
Linked references are available on JSTOR for this article:
http://www.jstor.org/stable/29771599?seq=1&cid=pdf-reference#references_tab_contents

You may need to log in to JSTOR to access the linked references.

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at http://www.jstor.org/page/info/about/policies/terms.jsp

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.

Sage Publications, Inc. is collaborating with JSTOR to digitize, preserve and extend access to *Inquiry*.

http://www.jstor.org

All use subject to JSTOR Terms and Conditions

Marc L. Berk
Amy B. Bernstein
Amy K. Taylor

The Use and Availability of Medical Care in Health Manpower Shortage Areas

Data from the National Medical Care Expenditure Survey were used to examine access to care and utilization of health services in federally designated health manpower shortage areas (HMSAs). It was confirmed that residents of shortage areas experience some deprivation in access to care and use of services. Further analysis, however, indicated that shortage area designation has little direct effect on indicators of access and use. Factors such as income and health insurance coverage appear to be more closely associated with access and use than is an area's designation as a HMSA. The assumptions concerning access to care in federally designated shortage areas should therefore be reexamined.

The unequal distribution of physicians in the United States has led to concern about access to medical care in underserved communities.[1] The designation of health manpower shortage areas (HMSAs) and the development of the National Health Service Corps (NHSC) are major components of the federal government's effort to create a more equitable distribution of physicians in the United States. Areas designated as shortage areas are eligible to serve as placement sites for physicians in the NHSC. And, until recently, physicians who located in HMSAs could have obtained cancellation of educational loans. For fiscal 1983 the Reagan administration proposed $103.4 million for the staffing of the NHSC program and an additional $11 million for the continuation of existing scholarships.[2] Although new scholarships will no longer be awarded, important allocation decisions must still be made because the NHSC program will continue and current recipients of NHSC awards must still complete their service obligations. This paper examines access to medical care and the utilization of health services by those who reside in HMSAs. The study assesses whether current criteria result in a valid distinction between areas with adequate access to medical care and those with inadequate access.

The historical background of federal efforts to designate physician shortage areas has been described by Lee.[3] In 1970, with the passage of P.L. 91-623, the NHSC was created and in 1972 amendments were enacted requiring that NHSC personnel be placed in areas considered to be "critical health manpower shortage areas." These shortage areas were defined as counties or subcounties with a primary care physician/population ratio of less than 1:4,000. Measures of access to care or health service utilization were not directly considered in the shortage area designation process.

An early criticism of HMSA criteria, however, was that they generally did not consider

---

Marc L. Berk, Ph.D., Amy B. Bernstein, M.H.S.A., *and* ***Amy K. Taylor, Ph.D.,*** *are researchers with the National Center for Health Services Research, Rockville, MD 20857.* *The authors thank Dan Walden and Sam Korper for their useful comments on an earlier draft. The views expressed in this paper are those of the authors, and no official endorsement by NCHSR is intended or should be inferred.*

Inquiry 20: 369–380 (Winter 1983). © 1984 Blue Cross and Blue Shield Association.
0046-9580/83/2004-0369$1.25

measures of "underservice" but instead focused almost exclusively on physician/population ratios. An area with a low physician/population ratio could be classified as a shortage area even in the absence of evidence that medical services were underutilized. Although since 1978 additional criteria are now considered, the primary determinant in the designation process is still the population/physician ratio for each geographic area considered to be a "rational service area" for the delivery of health care services. An area is considered to be a shortage area if it is a rational area for the delivery of services and if the area has a population/primary care physician ratio of 3,500:1 or more. In addition, medical care in contiguous areas must be overutilized, excessively distant, or inaccessible to the population under consideration.

In general, measures of community health status are not taken into consideration in the determination of shortage areas. The only exception is that measures of health status and service capacity are used to make the determination when the population/primary care physician ratio exceeds 3,000:1 but is less than 3,500:1. In these cases, infant mortality, poverty levels, average waiting times for appointment, average waiting times at site of care, and other measures of need and capacity are used to make the designation. It must be emphasized, however, that measures of capacity and need are used only when the population/physician ratio is between 3,000:1 and 3,500:1. An area with a population/physician ratio in excess of 3,500:1 would qualify as a shortage area regardless of its ranking on measures of access and utilization.

The present analysis was designed to determine whether residents of HMSAs either underutilize services or experience unreasonable inconvenience when seeking medical care. We assume that current federal policies to redistribute physicians are based primarily on the premise that physician shortages result in reduced availability of care or in lower utilization of health services, controlling for health status. If such deprivations cannot be attributed to a lack of physicians, perhaps assumptions behind efforts to redistribute physicians should be reconsidered.

Several previous studies have considered the problem of designating physician shortage areas. Werner, Langwell, and Budde[4] have criticized the emphasis on physician/population ratios, noting that they do not consider differences between specialties in the total hours worked, allocation of time to different practice activities, and productivity. In addition, the ratio approach assumes that quality of care and the nature of the patient visit are uniform across medical specialty and geographic regions.

The usefulness of the HMSA designation was the subject of empirical investigations by the U.S. Department of Health, Education, and Welfare[5] and by Chiu, Aday, and Andersen.[6] The DHEW study was conducted by Mathematica Policy Research, which attempted to apply HMSA designation criteria to an analysis of access to care in Montreal and Quebec City. The analysis plan used HMSA criteria to establish shortage areas in Quebec. The study then examined whether access to primary care in designated shortage areas was poorer than in nonshortage areas. The results were mixed, with residents of shortage areas showing fewer total visits and complete examinations but not experiencing deprivations with respect to other measures of utilization.

The Chiu et al. study also examined access to care and utilization of services in HMSAs. The authors concluded that HMSA codes appear "to discriminate those areas in which people experienced more inconvenience in obtaining care but not those in which the actual rates of physician contact were lower."[7]

Only limited inferences can be made from this research. The DHEW study is limited to an analysis of data from Quebec and does not allow for national estimates for the U.S. population on indicators of access and utilization. The Chiu et al. study uses a national sample, but the procedure for classifying shortage areas is subject to question, since "any county with some part designated as a shortage area was classified in total as a shortage area for this analysis."[8] In many cases only a small portion of the county, such as a single town or even a school district, was classified as a HMSA; designating the entire county as a shortage area may therefore by problematic. For example, in 1979 New York State had only three entire counties that were classified as HMSAs, although areas in 39 other counties were classified as HMSAs. The application of the classification procedure developed by the Center for Health Administration Studies would therefore result in the classification of two-thirds of New York's 62 counties as HMSAs. Moreover, all of New York City would be considered a shortage area, since at least a small part of each of the city's five counties was classified as a HMSA. The majority of residents of New York City, however, do not live in shortage areas, and the city has one of the largest supplies of health personnel in the country. Similarly, 39 counties in California would be considered shortage areas even though only two fall completely within federally designated HMSAs.

This study reexamines HMSA designation criteria with new data that enable us to define shortage areas with greater precision than was done previously. The approach used here offers a major advantage over earlier work in analytic specificity in that hand coding was used to assign the shortage area designation. The data and procedures for defining shortage variables as well as indicators of access and utilization are described below.

Materials and Methods

The data for this analysis were supplied by the National Medical Care Expenditure Survey (NMCES), which was designed to provide the most comprehensive statistical picture to date of how health services are used and paid for in the United States. Data were collected from 40,000 individuals in the civilian noninstitutionalized population. Each respondent was interviewed six times over an 18-month period about use of and expenditures for health care services during 1977.[9] Respondents were scattered throughout the 50 states and the District of Columbia. The survey used a three-stage stratified area probability sample to help guarantee that reliable U.S. population estimates would be produced.[10]

Manpower Shortage Area Classification

To analyze the utilization of medical care in physician shortage areas, it is important to identify as precisely as possible the exact geographic boundaries of these areas. In this way, only those individuals who live in areas that fall completely within federally designated HMSAs will be classified as residing in a shortage area. The following procedure was used to determine whether a sample household was located in a designated manpower shortage area.

Each household was assigned a zip code from that recorded on the original survey instrument. These zip codes were encrypted to ensure confidentiality. Furthermore, the zip code tapes did not contain any data that could be linked to specific survey respondents. The data contractor then matched these zip codes with those of HMSAs and linked this classification to all the individuals in the sample who lived in designated shortage areas.

The smallest officially designated shortage areas were defined by contiguous 1970 U.S. Census tracts. In almost all cases, researchers from the National Center for Health Services Research were able to obtain census tract maps of cities and areas used in the survey. Designated manpower shortage areas were marked by hand on these maps, using the official *1979 Manpower Shortage Areas Designated Areas* published in the August 6, 1979, *Federal Register.*[11] Using the street names on the census tract maps, it was possible to look up the zip codes in the *U.S. Postal Service 1977 National Zip Code and Post Office Directory,* and in this way a given zip code in the survey could be declared a shortage area or a nonshortage area. In the few instances where a census tract map was not available, it was possible to find zip code maps of cities in telephone books, which enabled the researchers to see where zip codes were located in the cities and then determine whether these areas fell within designated shortage areas.

The first stage of the three-stage probability sample of the NMCES involved the selection of national area samples (counties, parts of counties, or groups of contiguous counties), which ensured that there would be sufficient geographic dispersion of the sample and that all geographic areas of the United States would be represented. These areas were called primary sampling units (PSUs). The second stage involved the selection of secondary sampling units to be surveyed, which were chosen from specific parts of the PSUs. These secondary sampling units consisted of census enumeration districts or block groups. In the third stage,

Table 1. Demographic comparisons (percentage) of physician manpower shortage areas with nonshortage areas, United States, 1977

	Total population		**Urban population**		**Other population**		**Rural population**	
Variable	HMSA	Non-HMSA	HMSA	Non-HMSA	HMSA	Non-HMSA	HMSA	Non-HMSA
Age in years								
<18	32.1	29.9	33.3	29.8	32.1	29.8	30.8	30.6
18–64	57.7	59.5	56.7	61.9	58.6	58.9	56.9	57.1
65+	10.3	10.6	10.0	8.3	9.3	11.2	12.3	12.3
Income								
<$12,000	39.1	31.3	39.8	25.8	33.5	32.3	48.3	38.5
$12,000–$19,999	27.9	27.6	26.8	23.7	28.0	28.8	28.9	29.9
$20,000+	33.0	41.1	33.4	50.5	38.5	38.9	22.8	31.7
Race								
White	69.0	84.5	42.6	80.8	74.4	85.0	84.3	90.1
Nonwhite	31.0	15.5	47.4	19.2	25.6	15.0	15.7	9.9
Region								
Northeast	16.3	22.7	40.1	36.6	12.0	19.3	2.0[a]	9.4[a]
North Central	19.5	29.1	38.1	28.3	15.4[a]	26.2	9.6[a]	50.0[a]
South	50.8	29.3	14.1[a]	14.8	48.9	35.4	88.6	26.0
West	13.4[a]	19.0	7.7[a]	20.3	23.8[a]	19.1	—	14.6[a]

Source: National Health Care Expenditures Study (Rockville, MD: National Center for Health Services Research).

[a] Denotes a relative standard error greater than or equal to 30%.

small areas—called segments—within the secondary sampling units were designated, from which actual households were chosen. Segments consisted of groups of some 60 households or more, but were always considerably smaller than the areas covered by one zip code. An independent contractor, adhering to formal confidentiality requirements, compared each unencrypted zip code with the unencrypted PSU-segment combination that it most closely matched, keeping the shortage area indicators we had determined attached. The zip codes were then dropped from the shortage area indicator tape, and the encrypted PSU-segment combinations, with attached shortage indicators, were returned for analysis. It was possible to match the shortage area indicators with the household data by the PSU-segment combinations, so that all persons in our sample who resided in a PSU-segment combination deemed to be a shortage area would be so identified. When a segment overlapped two zip codes, we assumed that residents lived in a shortage area if one of the zip codes was designated a HMSA.[12]

Indicators of Access

Because one of the main assumptions underlying the designation of manpower shortage areas is that inhabitants have difficulty getting to see a physician when needed, we tested several measures of access to health care in and out of manpower shortage areas. Shortage and nonshortage areas were further stratified by degree of urbanization, for it is likely that persons residing in a large city experience different problems in access to health care than do rural residents. Four aspects of access to health care were analyzed:

- ☐ the likelihood of having *any* physician visits in 1977
- ☐ the number of physician visits in 1977
- ☐ travel time to usual source of medical care
- ☐ waiting time in the medical provider's office or place of practice

Degree of urbanization was divided into 1) urban, or residents of the 16 largest standard metropolitan statistical areas (SMSAs); 2) rural, or residents of non-SMSAs deemed by the 1970 U.S. Census to be more than 60% rural; and 3) all other areas, which were mainly smaller SMSAs and less rural non-SMSA areas.

We use the data presented here to examine differences in demographic characteristics among persons in designated shortage areas and in nonshortage areas. These differences in measures of access to health care are presented separately for residents of urban, rural, and

Table 2. Comparisons of perceived health status, insurance coverage, physician visits, and indicators of access to care by shortage area designation, United States, 1977

Variable	Total population		Urban population		Other population		Rural population	
	HMSA	Non-HMSA	HMSA	Non-HMSA	HMSA	Non-HMSA	HMSA	Non-HMSA
Perceived health status								
Excellent or good (%)	82.5	86.4	84.1	88.0	84.4	86.0	78.0	85.5
Fair or poor (%)	17.5	13.6	16.0	12.1	15.6	14.0	22.0	14.6
Insurance coverage								
Private or CHAMPUS/CHAMPVA (%)	66.4	73.3	59.0	77.8	67.8	72.1	63.4	69.4
Medicaid (%)	16.7	9.7	24.7	10.0	14.5	9.6	13.4	9.6
Medicare and private (%)	5.8	7.4	5.2	5.6	6.1	8.1	5.9	7.5
Medicare, no private (%)	2.8	2.2	2.6	1.7	2.1	2.3	4.3	3.4
Uninsured (%)	10.2	7.4	8.6	4.9	9.5	7.9	13.0	10.1
Number of physician provider visits								
0 (%)	28.0	23.4	29.9	22.6	26.1	23.3	29.7	26.4
1–5 (%)	49.9	52.4	48.2	51.5	50.1	52.7	51.1	52.4
6+ (%)	22.1	24.2	21.9	25.9	23.8	24.1	19.2	21.2
Usual source of care[a]								
No source (%)	18.5	15.6	21.8	18.3	18.3	15.5	15.9	10.0
Doctor's office (%)	61.1	73.9	51.4	68.8	64.6	74.2	63.9	84.7
Institution (%)	18.9	9.3	24.1	11.9	16.3	9.0	18.6[b]	4.4
Travel to usual source of care								
0–30 min. (%)	84.8	92.9	86.5	91.4	91.8	93.6	70.9	92.4
31+ min. (%)	15.2	7.1	13.5	8.7	8.2	6.4	29.1	7.6
Mean waiting time at physician's office (min.)	30.8	24.5	36.1	24.0	26.9	24.9	34.2	23.1
Mean treatment time at physician's office (min.)	24.6	25.9	22.7	27.2	29.9	25.4	15.0	24.8

Source: National Health Care Expenditures Study (Rockville, MD: National Center for Health Services Research).

[a] Excludes those with "other" sources of care, including home visits and designated "other."

[b] Denotes relative standard error greater than or equal to 30%.

other areas. We also used multivariate analysis to determine which demographic characteristics, including residence in a designated shortage area, are associated with differences in measures of access to health care.

Findings

We estimate that in 1977 approximately 14.4% of the U.S. population resided in federally designated shortage areas. About 26% of shortage area residents lived in urban areas, 27% lived in rural areas, and about 48% lived in other areas.

Table 1 presents a comparison of demographic characteristics of residents of shortage areas with residents of nonshortage areas. Separate estimates are derived for residents of urban, rural, and other areas so that differences by place of residence can be examined.

We found no significant age differences between the shortage population and the residents of nonshortage areas. We observed significant income differences for residents of shortage areas, who had lower incomes than those in the nonshortage areas. Major differences by race were also observed: Nonwhites constituted 31% of the shortage area population and only about 15% of the population of nonshortage areas. Racial differences were particularly large in urban areas. Although nonwhites compose only about 19% of the nonshortage urban area population, more than 47% of the urban shortage area residents were nonwhite. There were also regional differences between the two areas. Residents of the South were much more likely than residents of other regions to be located in HMSAs.

Table 2 presents data by shortage area status on perceived health status, insurance coverage, physician visits, and indicators of access to

Table 3. Comparisons of selected utilization and access indicators by perceived health status and shortage area designation, United States, 1977

	Total population		Urban population		Other population		Rural population	
Variable	HMSA	Non-HMSA	HMSA	Non-HMSA	HMSA	Non-HMSA	HMSA	Non-HMSA
% with no physician visits								
Excellent or good health	30.1	25.2	32.3	15.7	28.0	14.1	32.0	22.5
Fair or poor health	17.4	13.2	24.0	13.6	25.1	13.0	28.8	13.5
% with travel time >30 min. to usual source of care								
Excellent or good health	13.1	6.6	12.3	8.3	7.5	6.0	24.7[a]	6.7
Fair or poor health	24.3	9.8	19.4	11.8	10.8	8.0	43.5	12.3
Mean waiting time (min.)								
Excellent or good health	32.9	26.1	38.2	26.3	30.0	26.0	33.6	26.7
Fair or poor health	42.6	32.8	51.8	31.1	36.8	33.8	44.4	29.5

Source: National Health Care Expenditures Study (Rockville, MD: National Center for Health Services Research).
[a] Denotes a relative standard error greater than or equal to 30%.

care. Residents of shortage areas were somewhat more likely than nonshortage area residents to perceive their health as fair or poor. Shortage areas also differed with respect to insurance coverage. Shortage area residents were more likely to be uninsured and less likely to have private health insurance. In addition, a relatively large percentage of shortage area residents are Medicaid beneficiaries, with about 17% having Medicaid coverage compared with 10% of nonshortage area residents. The difference is especially large in urban areas. Almost 25% of the urban shortage area population was covered by Medicaid compared with about 10% of nonshortage area urban residents.

There was a small difference in the likelihood of having a physician visit, with 28.0% of shortage area residents reporting no visits compared with 23.4% of the nonshortage area population. This difference was also slightly larger in urban areas.

We also examined several indicators of access to care. Residents of shortage areas were less likely to report having a usual source of care, but the differences were not large. There was, however, a major difference in the average travel time it took for the patient to arrive at his or her usual site of medical care. About 15% of shortage area residents traveled more than 30 minutes compared with only 7% of those residing outside shortage areas. These differences were especially pronounced in rural areas, where over 29% of the shortage area population traveled more than 30 minutes compared with less than 8% of those in rural nonshortage areas. Residents of shortage areas also reported waiting about six minutes longer to see the physician than did residents of nonshortage areas. Differences in the time actually spent with the physician were small, except in rural areas, where residents of shortage areas spent only 15 minutes with the physician compared with about 25 minutes for residents of rural nonshortage areas.

Efforts to increase access to care would seem to be particularly important for that part of the population that is not in good health. Table 3 presents comparisons between shortage and nonshortage area residents for the probability of having a physician visit in 1977, the percentage with travel time over 30 minutes, and mean waiting time, controlling for perceived health status. Although this serves only as a general proxy for actual health status, there is some evidence that subjective health assessments are closely correlated with evaluations made by physicians.[13]

Our findings suggest that controlling for perceived health status does not affect overall differences in the probability of having a physician visit by shortage designation. In rural areas, however, the effect of shortage area designation for those in fair or poor health is greater. About 29% of the residents of shortage areas did not see a physician in 1977 even though they perceived their health as fair or poor, whereas less than 14% of those with compa-

Table 4. Regression estimates for whether person had any physician visits in 1977

	Total population		Urban population		Other population		Rural population	
Variable	Parameter	*t* value	Parameter	*t* value	Parameter	*t* value	Parameter	*t* value
Person resides in manpower shortage area	−.0192	−2.81*	−.0424	−2.94*	−.0116	−1.24	−.0091	−.54
Age in years[a]								
0–18	−.0865	−5.74*	−.0764	−2.36*	−.0943	−4.95*	−.0865	−2.25**
19–64	−.0589	−3.99*	−.0627	−1.97**	−.0605	−3.25*	−.0618	−1.66
Poverty or low income[b]	−.0023	−.31	−.0344	2.11**	−.0111	−1.17	−.0179	−1.03
Insurance coverage[c]								
Private only	.0962	11.74*	−.0754	3.74*	−.0891	8.98*	.1428	6.80*
Medicaid	.0845	7.57*	−.0635	2.53*	−.0867	6.20*	.0745	2.59*
Private and Medicare	.0780	4.45*	−.0473	1.19	−.0710	3.27*	.1287	2.82*
Medicare only	−.0006	−.03	−.0231	−.47	−.0084	−.31	.0357	.72
White persons[d]	.0591	10.15*	.0697	6.11*	.0506	6.79*	.0730	4.16*
Persons in excellent or good health[e]	−.1086	−15.64*	−.1041	−7.02*	−.1065	−12.15*	−.1248	−7.01*
Geographic region[f]								
Northeast	.0095	1.41	.0075	.51	.0190	2.24**	−.0649	−2.37**
North Central	.0028	.44	−.0014	−.09	.0093	1.20	−.0121	−.72
West	.0191	2.77*	.0228	1.38	.0138	1.69	.0660	2.68*
Person has usual source of care[g]	.2499	38.13*	.2552	20.19*	.2416	29.02*	.2887	14.01*
Degree of urbanization[h]								
Small city, suburb, or <60% rural	−.1111	−1.95**						
>60% rural, non-SMSA	−.0508	−6.02*						

Source: National Health Care Expenditures Study (Rockville, MD: National Center for Health Services Research). [a] 65 and over omitted. [b] Not poor or near poor omitted. [c] Uninsured omitted. [d] Nonwhite omitted. [e] Persons in fair or poor health omitted. [f] South omitted. [g] No usual source of care omitted. [h] Urban SMSA omitted. * Significant at .01 level. ** Significant at .05 level.

rable health in rural nonshortage areas failed to obtain such medical care.

Almost 24% of those who considered themselves to be in fair or poor health and who resided in shortage areas traveled more than 30 minutes to their usual source of care, whereas less than 10% of those in nonshortage areas traveled this long. The difference in travel time by shortage area was much smaller for those who perceived themselves to be in good or excellent health. Travel time differentials were highest in rural areas, where more than 43% of those with fair or poor perceived health had to travel more than 30 minutes to see a physician. Less than 12% of their counterparts in nonshortage areas traveled more than 30 minutes. Waiting time differentials for those in fair or poor health were also largest in the rural areas, where average waiting time was about 45 minutes for those in shortage areas compared with about 30 minutes for those living outside shortage areas.

These findings seem to indicate that residents of shortage areas used fewer medical services and had poorer access to care than did residents of nonshortage areas. Shortage area residents were somewhat less likely to have visited a physician; the difference was especially evident among those in poor health residing in rural areas. There were also inequities in waiting time and travel time, where again those in fair or poor health who resided in rural shortage areas experienced the largest deprivations.

These differences, however, are difficult to interpret. To assess more fully the effects of living in a HMSA, it is necessary to go beyond simple comparisons between shortage and nonshortage areas. Other factors that might affect the use of medical services were not held

Table 5. Regression estimates for number of physician visits per person in 1977

Variable	Total population		Urban population		Other population		Rural population	
	Parameter	*t* value	Parameter	*t* value	Parameter	*t* value	Parameter	*t* value
Person resides in manpower shortage area	−.1429	−1.43	−.3478	−1.53	−.0305	−.22	−.2782	−1.36
Age in years[a]								
0–18	−1.3108	−5.95*	−2.6354	−5.16	−1.0940	−3.93*	−.4101	−.88
19–64	−.4508	−2.09**	−1.6887	−3.36*	−.2158	−.79	.1863	.41
Poverty or low income[b]	−.0164	.15	−.6895	2.69*	−.1856	−1.34	−.1020	−.48
Insurance coverage[c]								
Private only	.1857	6.43*	.6433	2.02+	.6991	4.83*	1.2430	4.85*
Medicaid	1.4272	8.76*	.9901	2.50*	1.5938	7.81*	1.2175	3.48*
Private and Medicare	2.0384	7.96*	1.6106	2.57*	2.0261	6.39*	2.7437	4.94*
Medicare only	.4977	1.62	.0754	.10	.4612	1.19	1.3028	2.17**
White persons[d]	.5490	6.46*	.9291	5.16*	.3765	3.46*	.3466	1.62
Persons in excellent or good health[e]	−3.2291	−31.84*	−3.1905	−13.65*	−3.3797	−26.41*	−2.7005	−12.44*
Geographic region[f]								
Northeast	.2918	2.94*	.2032	.87	.3665	2.97*	−.5408	−1.62
North Central	−.0099	−.11	−.1089	−.45	.0963	.85	−.4153	−2.03**
West	.6481	6.44*	.4669	1.80	.6998	5.86*	.6389	2.13**
Person has usual source of care[g]	1.9975	20.86*	2.0923	10.49*	1.9065	15.69*	2.2704	9.04*
Degree of urbanization[h]								
Small city, suburb, or <60% rural	−.4071	−4.88*						
>60% rural, non-SMSA	−.9944	−8.07						

Source: National Health Care Expenditures Study (Rockville, MD: National Center for Health Services Research).
[a] 65 and over omitted. [b] Not poor and near poor omitted. [c] Uninsured omitted. [d] Nonwhite omitted. [e] Persons in fair or poor health omitted. [f] South omitted. [g] No usual source of care omitted. [h] Urban SMSA omitted.
* Significant at .01 level. ** Significant at .05 level.

constant in the previous tables. In particular, our findings show that a disproportionate number of nonwhites, the poor, and those with either Medicaid or no insurance at all reside in shortage areas. It is therefore unclear whether the observed differences in utilization and access to care are due to living in physician shortage areas or whether they can be attributed to racial, income, and insurance differences between the shortage and nonshortage populations. The use of multivariate regression procedures allows for an assessment of the independent effect of shortage area designation on indicators of access and utilization when other factors are held constant.

Multivariate Results

We estimated four equations that describe different aspects of the use of medical services and access to health care. These include estimates of the probability of having had a physician visit, the number of visits per person, the average waiting time per person, and the average travel time to source of care.

Table 4 shows regression estimates of the likelihood that a person had a physician visit in 1977.[14] We treated the manpower shortage variable as a dummy variable, with residents of HMSAs coded 1 and other residents coded 0. We also treated as dummy variables the effects of income, insurance coverage, race, perceived health status, region, population density, and presence of a usual source of care.

The results indicate that although the effect of living in a shortage area on the probability of having visited a physician is statistically significant, the size of the coefficient is very small. Living in a physician manpower shortage area

Table 6. Regression estimates for average waiting time per person

Variable	Total population		Urban population		Other population		Rural population	
	Parameter	*t* value	Parameter	*t* value	Parameter	*t* value	Parameter	*t* value
Person resides in manpower shortage area	4.2698	6.29*	6.7373	4.60*	2.6838	2.90+	−1.1742	−.74
Age in years[a]								
0–18	−.0692	−.05	1.0055	.34	−1.1205	−.63	1.9217	.58
19–64	−.3430	−.25	.9410	.33	−1.4577	−.84	1.2243	.38
Poverty or low income[b]	3.2687	4.47*	1.7171	1.08	2.9001	3.08*	5.7609	3.47*
Insurance coverage[c]								
Private only	−3.6110	−4.19*	−3.6792	−1.72	−2.9122	−2.81*	−5.9870	−2.70*
Medicaid	4.8313	4.26*	8.4381	3.25*	4.4428	3.16*	−1.5945	−.55
Private and Medicare	−4.5631	−2.76*	−2.5363	−.68	−5.4374	−2.64*	−5.4410	−1.32
Medicare only	.4832	.23	7.3032	1.52	.1535	.06	−8.1543	−1.77
White persons[d]	−7.1324	−12.28*	−10.8541	−9.54*	−5.1837	−6.95*	−6.3180	−3.70*
Persons in excellent or good health[e]	−4.7223	−7.43*	−3.1509	−2.32+	−5.5893	−6.97*	−2.9363	−1.83
Geographic region[f]								
Northeast	−5.0888	−7.72*	1.4872	1.02	−6.3840	−7.78*	−19.2516	−7.23*
North Central	−6.7236	−11.07*	−1.3579	−.89	−6.9115	−9.08*	−14.5769	−9.35*
West	−10.9707	−16.32*	−6.7865	−4.17*	−11.0723	−13.83*	−15.1180	−6.61*
Person has usual source of care[g]	1.5360	2.07**	−.5776	−.40	2.7922	2.98*	−.5940	−.25
Degree of urbanization[h]								
Small city, suburb, or <60% rural	−1.2537	−2.25**						
>60% rural, non-SMSA	−.8101	−.97						

Source: National Health Care Expenditures Study (Rockville, MD: National Center for Health Services Research).
[a] 65 and over omitted. [b] Not poor or near poor omitted. [c] Uninsured omitted. [d] Nonwhite omitted. [e] Persons in fair or poor health omitted. [f] South omitted. [g] No usual source of care omitted. [h] Urban SMSA omitted. * Significant at .01 level. ** Significant at .05 level.

decreased the probability of visiting a physician by less than 2%. The probability of having obtained medical care appears to be much more a function of age, insurance coverage, race, health status, and whether or not one has a regular source of medical care. We also estimated separate regression equations for urban, rural, and other areas, but in none of these cases was the effect of shortage area designation substantial.

Table 5 provides estimates for the number of physician visits. Living in a shortage area had only a negligible effect on the number of visits obtained from a physician. Again, the effects of age, insurance coverage, race, health status, and region of the country on physician visits were more significant than the effect of HMSA designation.

Table 6 presents multivariate estimates for average waiting time per person at the source of medical care. When other variables are used as controls, the effect of living in a shortage area remains statistically significant. Overall, residents of shortage areas waited about four minutes longer than did those living in nonshortage areas. In rural areas, however, residents of shortage areas actually waited slightly less, although this result is not statistically significant. It can be argued that the inconvenience experienced by nonrural residents who live in shortage areas is not severe. Whether a waiting time inequity of about four minutes should be the subject of public policy initiatives is indeed subject to question.

Table 7 presents regression estimates for travel time. The increased travel time associated with living in a shortage area was less than four minutes. Rural residents of shortage areas,

Table 7. Regression estimates for travel time to usual source of medical care for those persons with a usual source of medical care, United States, 1977

Variable	Total population		Urban population		Other population		Rural population	
	Parameter	*t* value	Parameter	*t* value	Parameter	*t* value	Parameter	*t* value
Person resides in manpower shortage area	4.3399	7.97*	2.1612	2.32**	−.4381	−.56	18.1314	13.31*
Age in years[a]								
0–18	.6470	.56	−1.0423	−.51	.5759	.37	4.1752	1.37
19–64	.3430	.30	−1.4530	−.73	.1131	.08	4.6749	1.56
Poverty or low income[b]	1.9376	3.25	.8689	.83	1.6392	2.04**	3.8224	2.66*
Insurance coverage[c]								
Private only	−1.8283	−2.73*	−.9476	−.69	−.7954	−.94	−6.3666	−3.57*
Medicaid	−.9028	−1.00	1.9675	1.17	−.7307	−.62	−4.7915	−1.98**
Private and Medicare	1.2723	.93	−.4455	−.18	.7358	.42	8.9864	2.44*
Medicare only	2.2967	1.39	−.4998	−.16	4.4500	2.03**	−.6467	−.16
White persons[d]	.1073	.23	−1.4951	−2.02**	1.1743	1.88	−3.1941	−2.16**
Persons in excellent or good health[e]	−2.6718	−4.94*	−3.3739	−3.58*	−1.2868	−1.81	−6.5364	−4.52*
Geographic region[f]								
Northeast	−4.0238	−7.54*	−2.7801	−2.99*	−4.3864	−6.32*	−2.9324	−1.31
North Central	−1.0820	−2.23**	−1.4876	−1.54**	−.1660	−.26	2.4347	1.83
West	.2760	.50	−.8262	−.79	1.2263	1.80	6.4894	3.08*
Population density[g]								
Small city, suburb, or <60% rural	−1.1285	−2.50*						
>60% rural, non-SMSA	2.5430	3.87*						

Source: National Health Care Expenditures Study (Rockville, MD: National Center for Health Services Research).
[a] 65 and over omitted. [b] Not poor or near poor omitted. [c] Uninsured omitted. [d] Nonwhites omitted. [e] Persons in fair or poor health omitted. [f] South omitted. [g] Urban SMSA omitted. * Significant at .01 level. ** Significant at .05 level.

however, do appear to suffer from a major inequity in travel time. Controlling for other factors, rural shortage area residents traveled more than 18 minutes longer than did the residents of nonshortage rural areas. It is evident that living in physician-poor rural areas results in a considerable lack of convenience when medical services must be obtained.

Discussion and Conclusions

This paper has examined several dimensions of the relationship between federally designated HMSAs and the use and availability of medical services for people who live in these areas. We found that although simple comparisons show some differences in the use of and access to health care by residents of shortage and nonshortage areas, these differences are not significant when analyzed with multivariate techniques. More specifically, when other factors such as income, race, and insurance coverage are not held constant, residents of shortage areas seem somewhat less likely to visit a physician. This is particularly true in rural areas. In addition, shortage areas tend to have higher waiting times and travel times than do nonshortage areas.

The multivariate analysis, however, indicates that these inequities are better explained by differences in income, racial composition, and insurance coverage between shortage and nonshortage populations than by differences in physician manpower. With the exception of travel time in rural areas, there is little reason to believe that the absence of physicians is the major reason for the differences in utilization and access to medical care between residents of shortage and nonshortage areas. The excess travel time experienced by rural residents of shortage areas may conceivably be reduced by policies that encourage physicians to locate in these areas. It is unclear, however, whether such policies could realistically be expected to solve the problem. Residing in a rural area generally implies a necessity of being willing to tolerate longer distances from many things and services. Rural residents must not only travel longer to reach the doctor but must also travel longer to obtain other goods and services. Because the multivariate analysis shows no difference in utilization of health services by rural residents in shortage and nonshortage areas, the increased travel time in shortage areas apparently does not diminish service use to an unacceptable level.

Implicit in most discussions of the National Health Service Corps and other federal policies concerning physician distribution is the assumption that deprivation of medical care and inequalities in access to care are related to the unequal distribution of doctors in the United States. We have examined this assumption and its implications for federal policies to relieve the maldistribution of physicians in this country. Our analysis shows that differences in the use of services and access to care between shortage and nonshortage areas are most likely due to factors other than a shortage of doctors, and thus that these differences are not likely to be eliminated by bringing more doctors into HMSAs.

We therefore conclude that the assumptions concerning access to care in manpower shortage areas should be reexamined. Our investigation suggests that residents of HMSAs do not appear to be using fewer physician services as a result of the low physician/population ratios in the areas in which they live. There are several possible explanations of these findings. One is that the current shortage index does not discriminate finely enough between areas where there is an absolute need for more doctors (such as counties with no doctors) and those where the number of physicians is relatively low. The current NHSC criterion of a 3,500:1 population/physician ratio was chosen in part because it selects those counties that fall into the bottom quartile of physician/population ratios.[15] Our analysis suggests that such a criterion may be somewhat arbitrary, since it fails to identify those areas in which lower access to care is a direct function of the absence of physicians. It might therefore be advantageous to develop new criteria that would more closely link deprivations in access and utilization with low levels of physician manpower. This could result in a reduction of current NHSC shortage sites, and thus make available more resources for areas with a more critical shortage of manpower.

It might also be possible that differences in utilization and access between shortage and nonshortage areas are not significant because of the beneficial impact that the NHSC program already achieved by 1977. By the end of 1977, however, fewer than 250 physicians had begun their NHSC service obligations,[16] so this explanation must be discounted.

Finally, residents of federally designated HMSAs may suffer inequities primarily because of their income, racial background, or lack of health insurance coverage. Consideration should therefore be given to the possibility that the current physician redistribution effort is a relatively inefficient mechanism for reducing inequities in access to care. This should not be interpreted as meaning that federal programs to increase the availability of medical care to disadvantaged groups are unwarranted. Rather, government programs to reduce inequities should focus on factors such as insurance coverage and income and not simply the number of doctors per capita.

Notes and References

1 See, e.g., M. A. Fruen and J. R. Cantwell, "Geographic Distribution of Physicians: Past Trends and Future Influences," *Inquiry* 19 (Spring 1982): 44–50; G. Tokuhata et al., "Health Manpower Distribution in Pennsylvania," *American Journal of Public Health* 65 (August 1975): 827–848; and K. Davis, M. Gold, and D. Makuc, "Access to Health Care for the Poor: Does the Gap Remain?" *Annual Review of Public Health* 2 (1981): 159–182.

2 *Budget of the United States Government Fiscal Year 1983* (Washington, DC: Executive Office of the President, Office of Management and Budget).

3 R. C. Lee, "Designation of Health Manpower Shortage Areas for Use by Public Health Service Programs,"

Public Health Reports 94 (January–February 1979): 48–59; R. C. Lee, "History and Objectives of Shortage Area Designation," in *Proceedings of the Workshop on Health Manpower Shortage Areas,* DHEW Publication (HRS) 77-51 (Hyattsville, MD: Department of Health, Education, and Welfare, Health Resources Administration, Bureau of Health Manpower, April 1977), pp. 47–54.

4 J. L. Werner, K.M. Langwell, and N. W. Budde, "Designation of Physician Shortage Areas: The Problem of Specialty Mix Variations," *Inquiry* 16 (Spring 1979): 31–37.

5 Mathematica Policy Research, *Evaluation of Health Manpower Shortage Area Criteria,* DHEW Publication (HRA) 80-20 (Washington, DC: Department of Health, Education, and Welfare, Health Resources Administration, Bureau of Health Professions, Division of Health Professions Analysis, April 1980).

6 G. Y. Chiu, L. Aday, and R. Andersen, "An Examination of the Association of 'Shortage' and 'Medical Access' Indicators," *Health Policy Quarterly* 1 (Summer 1981): 142–158.

7 Ibid., pp. 151–153.

8 Ibid., p. 145.

9 The NMCES was sponsored jointly by the National Center for Health Services Research (NCHSR) and the National Center for Health Statistics (NCHS), and the interviewing was conducted by the National Opinion Research Center (NORC) and the Research Triangle Institute (RTI). In addition to the household survey, the results of which are reported here, supplementary surveys were also conducted with the physicians and health care facilities providing care to household members during 1977 and the employers and insurance companies responsible for their insurance coverage.

10 Since the statistics presented in this report are based on this sample, they may differ somewhat from those that would have been obtained if a complete census had been taken. The potential difference between sample results and a complete count constitutes the sampling error, which is measured by a statistic called the standard error of the estimates. The calculation of standard errors in the NMCES has been described in S. B. Cohen, *NMCES Estimation and Sampling Variances in the Household Survey,* DHHS Publication (PHS) 81-3281 (Hyattsville, MD: National Center for Health Services Research, 1981). In this analysis, only significant differences are discussed in the text. Standard errors for these estimates may be obtained by writing to the authors.

11 This investigation examines only the HMSA designation for primary care shortage areas. We do not consider areas with shortages of dental, psychiatric, or vision personnel.

12 It is possible for a zip code area to be only partly inside a HMSA. People living in such an area would be classified as residents of a shortage area in this analysis. This procedure could result in a very small number of people being misclassified if they lived within a few blocks of a shortage area.

13 See D. G. Blazer and J. C. Houpt, "Perception of Poor Health in the Healthy Older Adult," *Journal of the American Geriatrics Society* 27 (July 1979): 330–334; and G. L. Madax and E. B. Douglass, "Self Assessment of Health: A Longitudinal Study of Elderly Subjects," *Journal of Health and Social Behavior* 14 (March 1973): 82–93

14 We estimated this equation using ordinary least squares. OLS has been shown to be appropriate in this situation because the probability of visiting a physician for the sample as a whole is approximately 75% and because the sample size is so large (40,000). See Takeshi Amemiya, "Qualitative Response Models: A Survey," *Journal of Economic Literature* 19 (December 1981): 1483–1536, and "Some Theorems in the Linear Probability Model," *International Economic Review* 18 (October 1977): 645–650.

15 Mathematica Policy Research (note 5), p. 27.

16 E. Michelson and N. Cronquist, "Scholarship Now for Service Later: Meeting the Health Manpower Needs of Medically Underserved Areas," *Public Health Reports* 94 (January–February 1979): 11–15.